Mobile radiography

INSTRUCTIONS FOR USE

PRACTIX 100 plus

Mobile Medical X-ray System

English

PHILIPS

Contents

Safety
- Electrical safety 4
- Mechanical safety 4
- Radiation protection 5
- Disposal 5
- Conformity 5
- Copyright 5
- Electromagnetic compatibility 6

Legend
- General view 7
- Possible movements 7
- Control desk 8
- Collimator 8
- Messages on the display 9

Operation
- Transport 10
- Positioning the unit 11
- Switching on the unit 12
- In the event of an error message 12
- Preparing the tube assembly 13
- Overview of operation 14
- Program overview 15
- Programmed exposure 16
- Manual exposure 17
- Radiography 18
- Terminating operation 19
- Parking the unit (in the parking position) 19
- Remote control 20

Programming
- Saving APR parameters 21

Maintenance
- Tests by the user 22
- Safety checks according to the Medical Device Directive 22
- Repairs 23
- Recording results 23
- Main fuse 23
- Cleaning 24
- Disinfection 24

Technical data 25

Appendix
- Exposure table 29

This manual is designed to make it possible for you to work with the X-ray equipment described safely. You may operate the X-ray equipment only in compliance with the safety instructions in this manual and not use it for purposes other than for which it is intended. The X-ray equipment may only be operated by persons who have the necessary expertise in radiation protection or knowledge of radiation protection and who have been instructed in how to operate the X-ray equipment.

In the United States, Federal law restricts this device to sale, distribution, and use by or on the order of a physician.

It is always the user who is responsible for compliance with the regulations applying to installation and operation of X-ray equipment.

- You must never use the X-ray equipment if it has any electrical, mechanical or radiological defects. This particularly applies to faulty indicators, displays, warnings and alarms.
- If the user wishes to connect the X-ray equipment to other equipment, components or assemblies and if it is not apparent from the technical data whether it can be safely combined with such equipment, components or assemblies, the user must ensure that the safety of the patient, operating staff and the environment is not affected by the planned combination by consulting the manufacturers involved or by making enquiries from an expert.
- Philips is responsible for the safety features of its products only if maintenance, repairs and modifications have been performed by Philips or by persons explicitly authorised to do so by Philips.
- As with any technical appliance, this equipment requires not only correct operation but also regular, competent maintenance and care, which are described in the section "Maintenance".
- If you operate the X-ray equipment incorrectly or if the user fails to have maintenance carried out properly, Philips cannot be held liable for any malfunctions, damage or injuries.
- Safety circuits must be neither removed nor modified.
- You may remove or open parts of the housing only if you are instructed to do so in this manual.

Electrical safety

This X-ray equipment meets the safety class I and type B according to IEC 60601-1.

Only trained maintenance staff may remove the covers from the high-voltage cable of the X-ray tube assembly and the high-voltage generator.

This X-ray equipment may only be operated in medical rooms which meet IEC requirements.

- You must never operate this X-ray equipment in areas where there is a risk of explosion.
- Detergents and disinfectants, including those used on patients, may create explosive mixtures of gases. Please observe the relevant regulations.

Mechanical safety

- Never hold the tube carrier arm to position the tube assembly. There is a risk you may trap your fingers! Use the grip on the tube assembly.
- Only transport the X-ray unit when the tube assembly arm has been locked in the transit position.

Radiation protection

Ensure that before each X-ray exposure all the necessary radiation protection measures have been taken.

When using X-radiation the personnel in the examination room must comply with the valid radiation protection regulations. In this respect please observe the following rules:

- To protect the patient against radiation always use radiation protection accessories in addition to devices which are fitted to the X-ray equipment (e.g. diaphragm, spacer, filter).
- Wear protective clothing. Radiation protection aprons with a lead equivalent of 0.35 mm attenuate X-radiation at 50 kV by 99.84%, and at 100 kV by 91.2%.
- Distance is the most effective radiation protection. Keep as large a distance as possible away from the object exposed and the X-ray tube assembly. Use the full length of the release switch cable.
- Avoid working in the direct beam of radiation.
- Always use the smallest X-ray field collimation. Scattered radiation is largely dependent on the volume of the object being exposed.
- Always select a focal spot to skin distance as long as possible to keep the absorbed dose for the patient as low as could reasonably be possible.
- Always be aware that any material brought into the path of radiation between the patient and the image receptor (e.g. film) will have a negative influence on the image quality as well as on the patient dose.

Safety circuits which may prevent X-radiation from being switched on under certain conditions may be neither removed nor modified.

Disposal

Philips manufactures state-of-the-art X-ray equipment in terms of safety and environmental protection. Assuming no parts of the system housing are opened and assuming the system is used properly there are no risks to persons or the environment.

To comply with regulations it is necessary to use materials which may be harmful to the environment and therefore have to be disposed of in a proper manner.

For this reason you must not dispose of the X-ray equipment together with industrial or domestic waste.

Philips
- supports you in disposing of the X-ray equipment described in a proper manner
- returns reusable parts to the production cycle via certified disposal companies and
- thus helps to reduce environmental pollution.

Consequently, do contact your Philips Service Organisation in full confidence.

Conformity

This Medical Device meets the provisions of the Medical Device Directive MDD 93/42 EEC (93).

If you have further questions regarding the applicable national or international standards, please address them to:

Philips Medical Systems DMC GmbH
Quality Assurance Department
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D-22335 Hamburg
Fax: (+49) 40/50 78-21 47

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This manual is a translation from the German.

When receiving data media the user acquires a non-exclusive, non-transferable right to use the software stored on them in connection with the hardware components delivered with it by Philips.

Changes to software, the use of which on hardware components other than those delivered by Philips in this connection (multiple use) or the making of copies, even for purposes of data backup, must be approved by Philips in writing beforehand.

Electromagnetic compatibility (EMC)

In accordance with its intended use, this electronic apparatus complies with the law governing EMC, which defines the permitted emission levels from electronic equipment and its required immunity against electromagnetic fields.

Nevertheless, it is not possible to exclude with absolute certainty the possibility that radio signals from high-frequency transmitters, e.g. mobile phones or similar mobile radio equipment, which themselves conform to the EMC regulations, may influence the proper functioning of electromedical apparatus if such equipment is operated in close proximity and with relatively high transmitting power. Therefore, operation of such radio equipment in the immediate vicinity of electronically controlled medical apparatus should be avoided to eliminate any risk of interference.

Explanation:
Electronic apparatus that satisfies the EMC requirements is designed so that under normal conditions there is no risk of malfunction caused by electromagnetic interference. However, in the case of radio signals from high-frequency transmitters with a relatively high transmitting power, the risk of electromagnetic incompatibility when operated in close proximity to electronic apparatus cannot be totally ruled out.

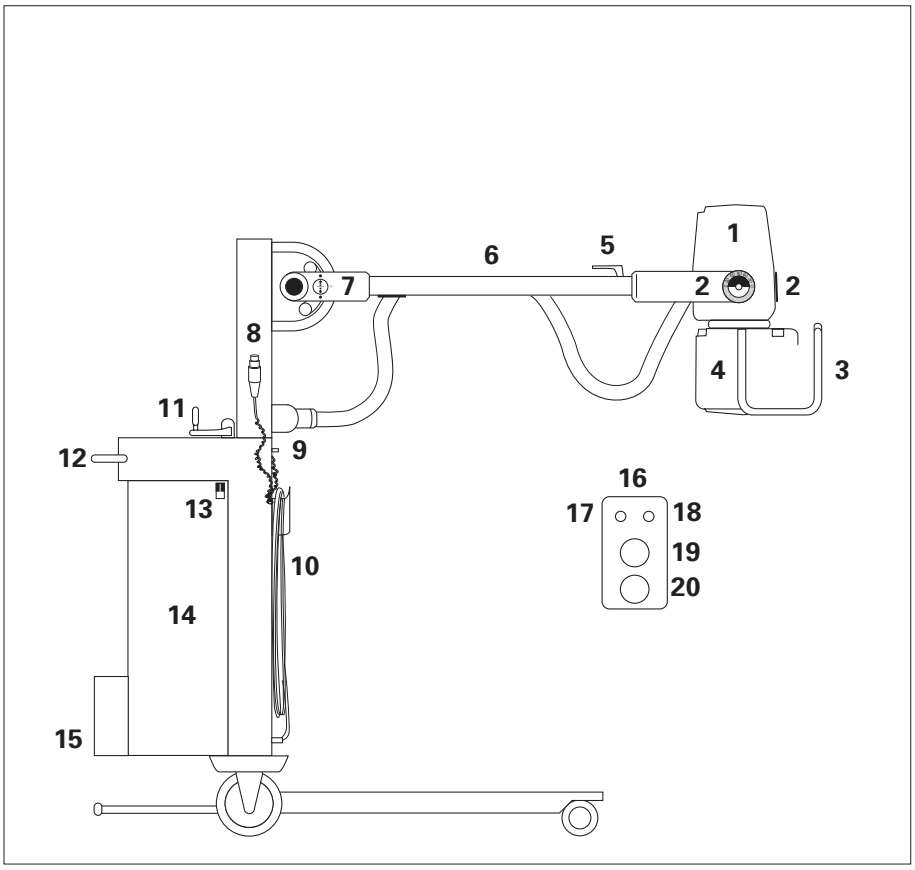
In unusual circumstances unintended functions of the apparatus could be initiated, possibly giving rise to undesirable risks for the patient or user.

For this reason, all kinds of transmission with mobile radio equipment should be avoided. This also applies when the apparatus is in „standby“ mode.

Mobile telephones must be **switched off** in designated problem zones.

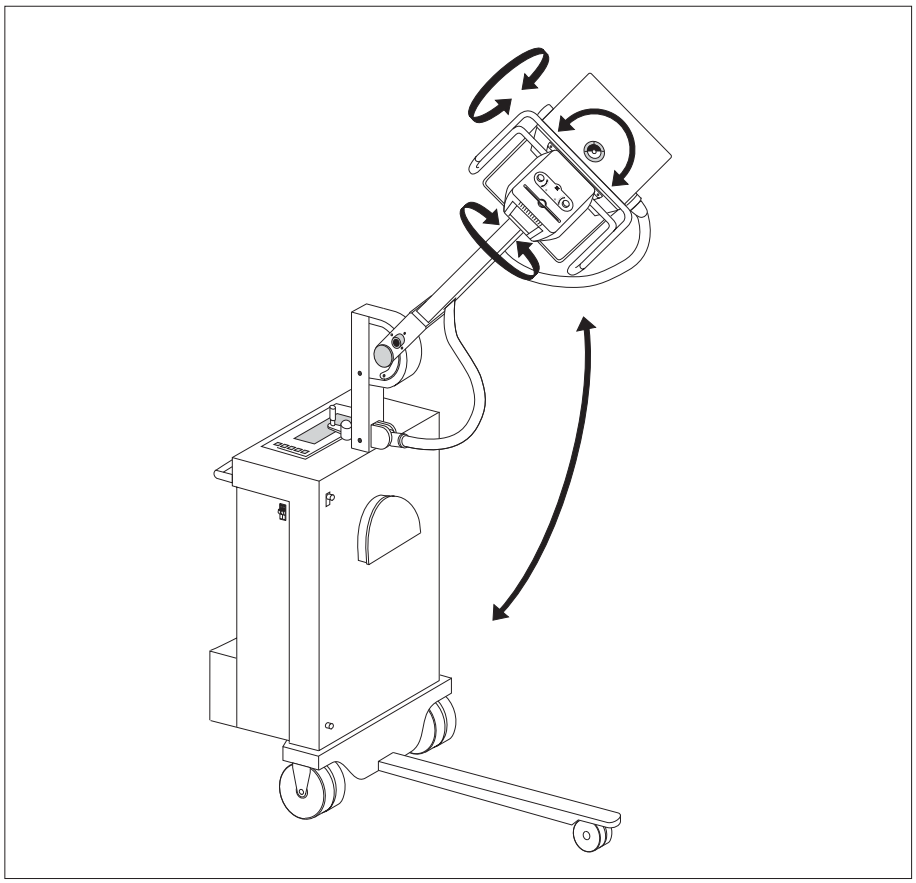
Legend

General view



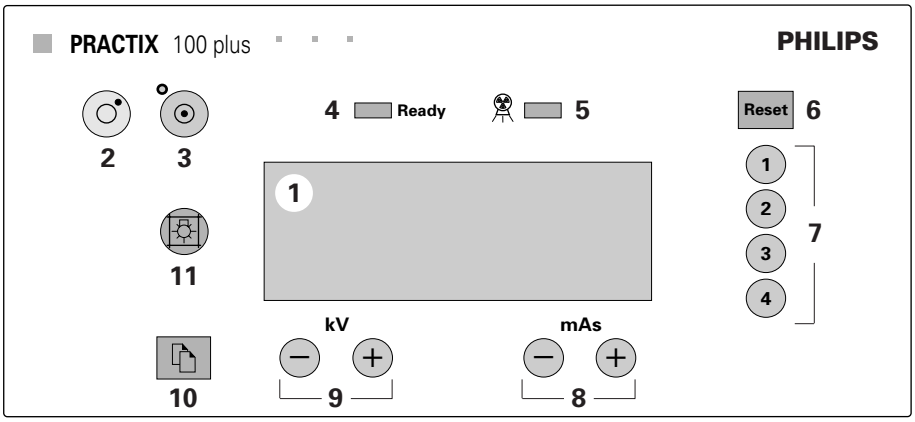
1 Tube assembly
2 Angle scales for position of tube assembly
3 Grip for positioning tube assembly
4 Collimator with light field indicator
5 Fixing grip for tube assembly swivel
6 Tube carrier arm
7 Transportation securing device
8 Handswitch for radiography
9 Equipotential bonding
10 Mains cable with holder
11 Travel joystick
– left: parking position
– centre: travel straight ahead
– right: parallel travel
12 Travel handle
13 Automatic cutout
14 Generator
15 Cassette compartment
16 Remote control (option)
17 Receiver indicator (LED)
18 X-ray on indicator (LED)
19 Release exposure
20 Switch on light beam lamp

Possible movements



Legend

Control desk



1 Display panel

2 Switch OFF unit

3 Switch ON unit

4 Ready display **Ready**
"Unit ready for radiation"

5 display
"Radiation ON"

6 Delete messages (or: return to APR menus)

7 Select APR menu line

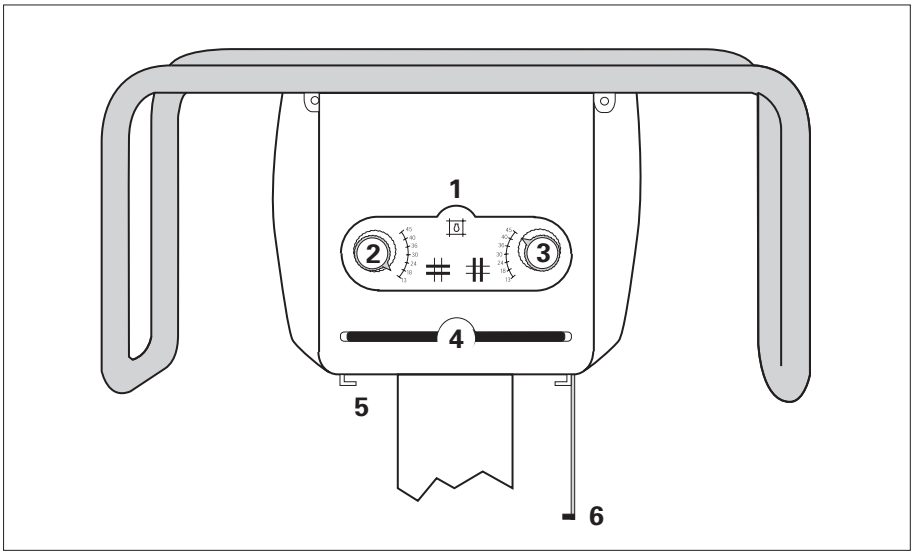
8 Change mAs

9 Change kV

10 Activate APR mode
(or: turn menu page)

11 Switch ON light field lamp

Collimator



1 Switch ON light field lamp

2 Open/close diaphragm at right angles to tube assembly

3 Open/close diaphragm longitudinally in relation to tube assembly

4 Slot for accessories

5 Rails for accessories

6 Tape measure for measuring SID (Source Image Distance)

Messages on the display

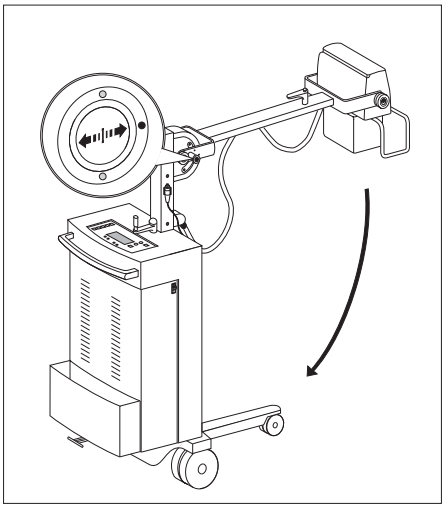
Message	Meaning	Action	Remark
MANUAL	Manual exposure/main menu.	–	–
READY	The unit is ready for exposure.	–	–
BUSY	A waiting time starts in order to prevent the X-ray tube assembly from overheating.	Wait for "READY" message.	–
CLOCK OFF	Fault in the electronic circuitry (clock generator).	Press reset button and continue.	–
POWER FAULT	Fault in the electronic circuitry (power supply).	Switch OFF, wait a while and try again, otherwise call Customer Service.	R
V3 FAULT	Fault in the electronic circuitry (low voltage V3).	Switch OFF, wait a while and try again, otherwise call Customer Service.	R
RESET APR	APR program data check.	Press reset button and continue.	–
APR OUT OF RANGE	An APR value is out of range.	Press "reset" and set APR value correctly.	–
TUBE SEASONING	After a lengthy operating interval (≥ 3 months) the X-ray tube has to be set in order to prevent damage.	Press reset button and continue, then call Customer Service to set X-ray tube.	R
FILAMENT	Fault in the electronic circuitry (heating circuit).	Switch OFF, wait a while, try again; otherwise call Customer Service.	R
HOT TUBE	The temperature of the X-ray tube has reached its maximum.	Press reset button and wait until the X-ray tube has cooled down.	R
V2 FAULT	Fault in the electr. circuitry (low voltage V2).	Switch OFF, wait a while, try again; otherwise call Customer Service.	R
STARTER INTERLOCK	Fault in the electr. circuitry (anode starting).	Press reset button and try again.	R
CHOPPER FAULT	Fault in the electronic circuitry (chopper).	Press reset button and try again.	R
TIME OUT	The handswitch has been pressed for longer than 15 s at position 1 (preparation for exposure).	Let go of handswitch, press reset button and repeat exposure.	–
LACK OF X-RAY	Fault in the electr. circuitry (tube voltage).	Press reset button and try again.	R
MAX TIME	Maximum exposure time (2 s) has been reached.	Press reset button and try again.	R
DATA ERR.	Fault in the electronic circuitry (data storage).	Switch OFF, wait a while, try again; otherwise call Customer Service.	R
MAN STOP RX	The handswitch has been released before the end of an exposure.	Press reset button, repeat exposure and only let go of handswitch after hearing the signal three times.	–
INVERTER KV ERR.	Fault in the electronic circuitry (converter).	Press reset button and try again.	R
INVERTER OVERLOAD	Fault in the electronic circuitry (converter).	Press reset button and try again.	R
INVERTER FAULT	Fault in the electronic circuitry (converter).	Press reset button and try again.	R
ERR. TUBE CALIBR.	Fault in the electronic circuitry (tube setting).	Switch OFF, wait a while, try again; otherwise call Customer Service.	R
HAND SWITCH ERR.	Fault in the handswitch.	Press "reset", check cable and connection, try again; otherwise call Customer Service.	R
Dose measuring unit (option):			
INACTIVE	Dosemeter not fitted.	–	R
ACTIVE	Dosemeter ready.	–	–
NOT OK	Dosemeter fitted but faulty.	Press reset button and try again.	R
MAXDOSE	Dose measurement has reached maximum.	Press APR menu 1-button to reset value.	–

R = error message saved on storage unit for Service Organisation

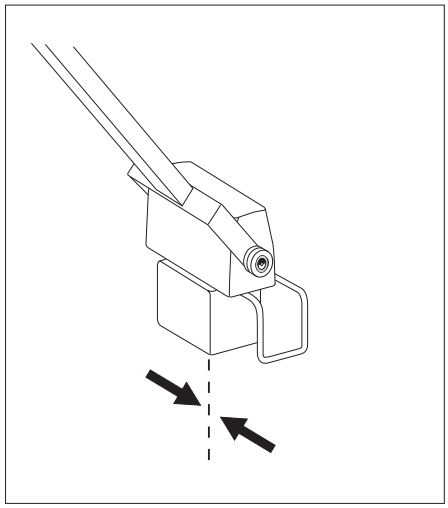
Transport

Please observe the following:
- Before transport
  – The unit must be switched off
  – The plug must be removed
  – The cable must be wound up (see page 19).
- For transport
  – Move tube assembly into the transport position
  – Lock the transport securing device.

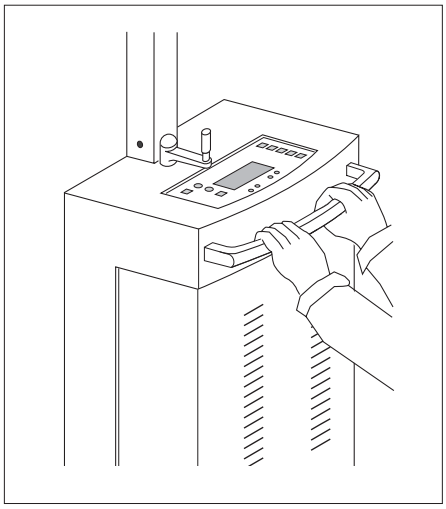
To ensure that the transport securing device, with the tube carrier arm in its lowest position, can lock into place:
- Set the knob with the arrow pointing to the **red** dot (see Fig. 1).



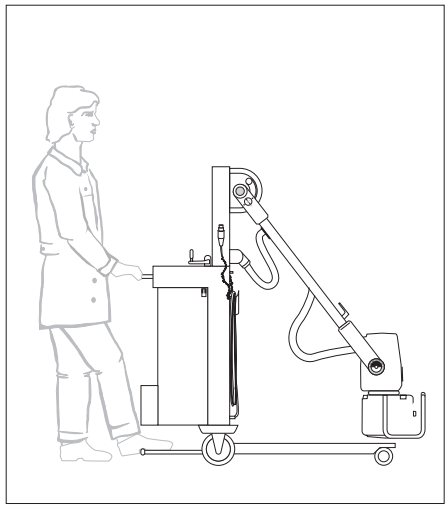
1. Swing tube carrier arm down until the transport securing device locks in place.



2. Set the tube assembly vertical and tighten the fixing grip.



3. To move straight ahead set the travel joystick straight.

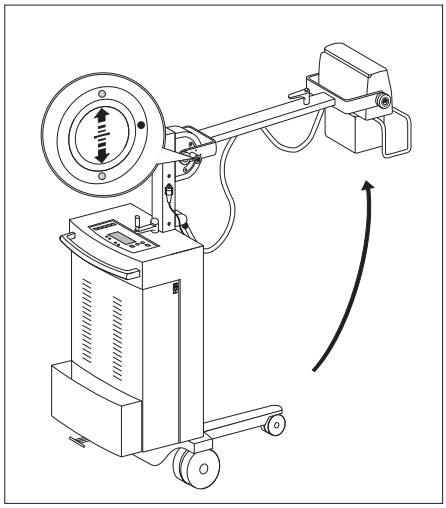


To manoeuvre over thresholds you can tilt the unit slightly by pressing on the bar under the generator with your foot.

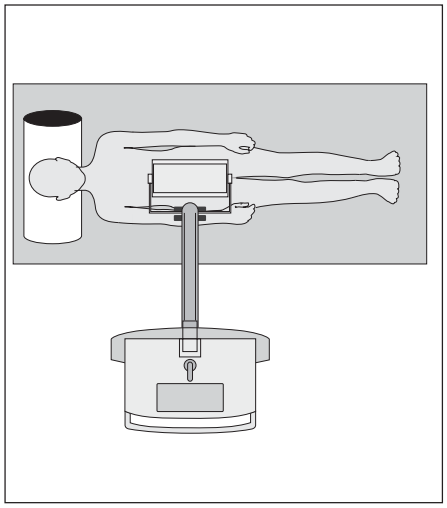
Positioning the unit

To prevent the transport securing device from locking in place unintentionally:

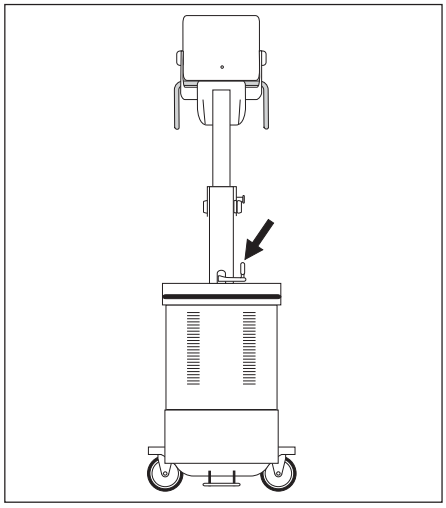
- Set button with the arrow pointing to the **green** dots (see Fig. 1).



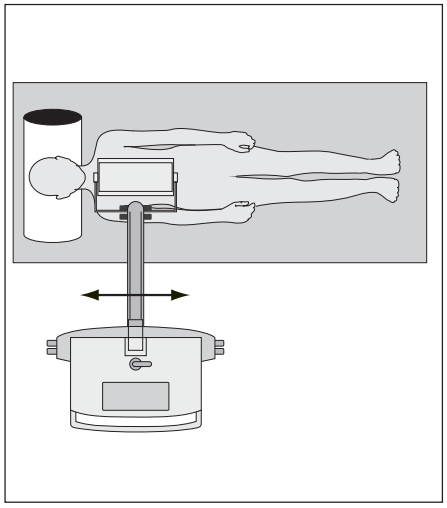
1. Pull out transport securing device button and swing tube carrier arm up.



2. Move the unit to the patient, preferably at right angles.

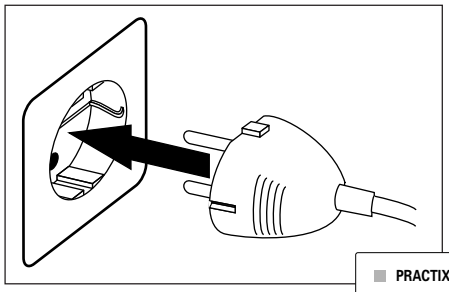


*3. To move in parallel set the travel joystick to the **right**. The wheels turn to the parallel travel position. A 45° position is also possible.*

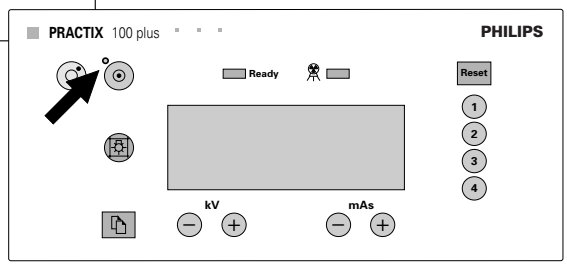


4. Position the tube assembly above the region of interest.

Switching on the unit



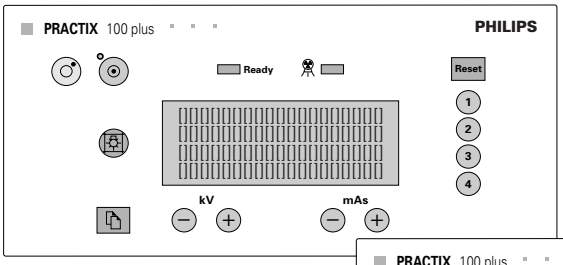
1. Insert the plug into the socket.

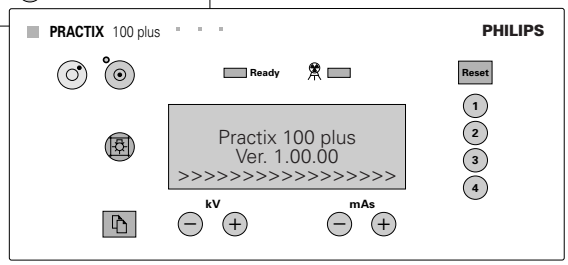


2. The yellow LED next to the ⊙ button is lit. Press the ⊙ button to switch ON the unit.

- If the yellow LED is **not** lit, check whether the main fuse for the unit has been switched off (see page 22).

After switching ON, the unit performs a self-test; then the current software version is displayed for approx. 3 s (example: VER. 1.00.00).





- When all the segments for the condensator charge have been displayed on the fourth line, the unit is ready for operation. During charging (approx. 1 min) and during short recharging intervals a high frequency tone is audible.

In the event of an error message

If an error message appears (see page 9):

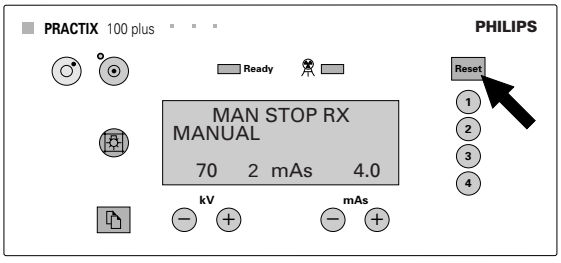
- press Reset

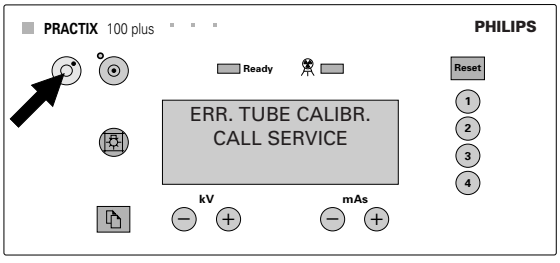
If the message remains:

- Switch off system
- Switch on system

If the message still remains:

- Call Customer Service

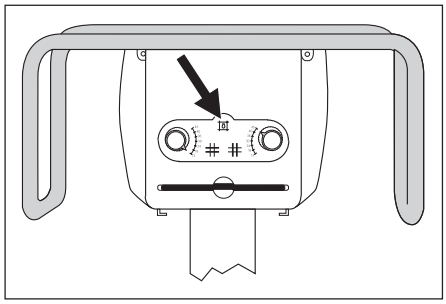




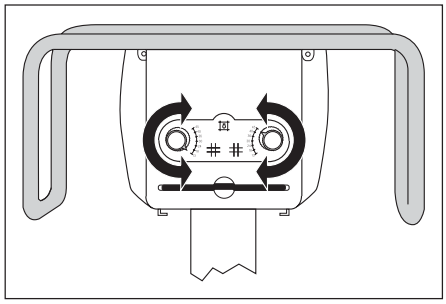
Note: The exposure parameters illustrated are only examples.

Preparing the tube assembly

- Position cassette.
- Position the unit and tube assembly accurately.



1. Switch ON the light field lamp (also possible with ⏻ on the control panel).

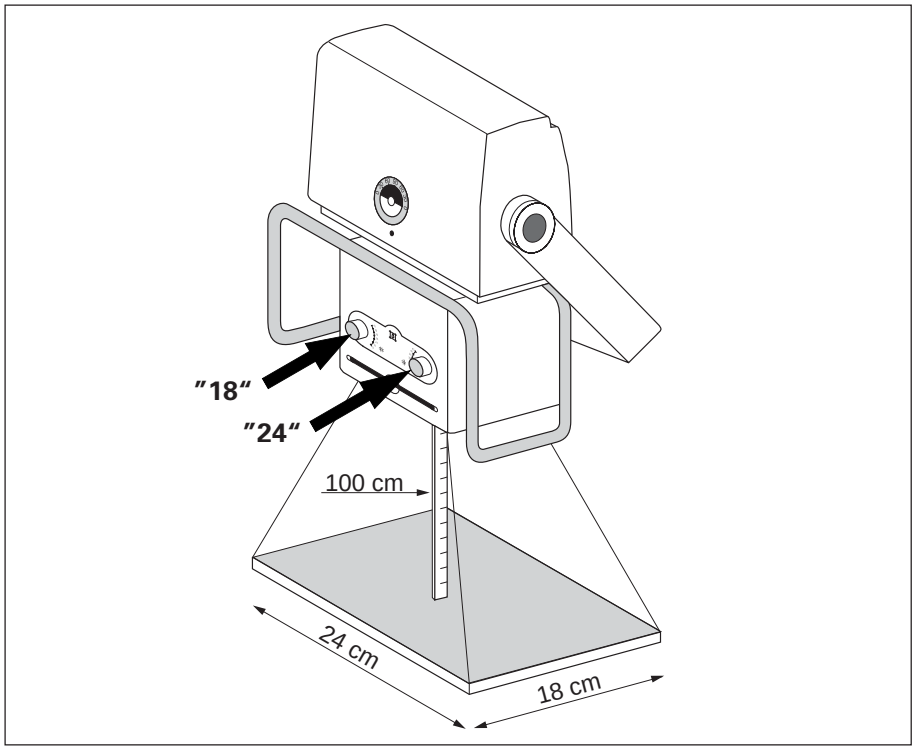


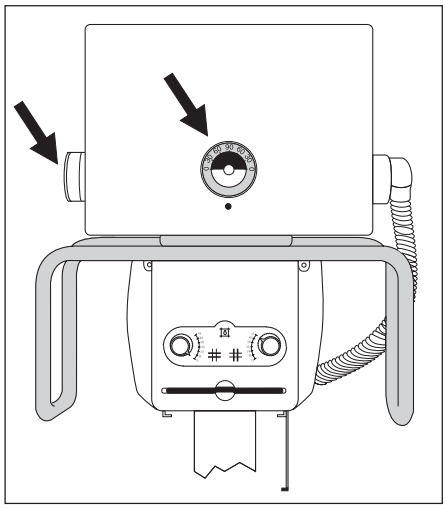
2. Collimate the light beam to the cassette size.

- Measure source-image distance (SID).
- Collimate the light beam to the cassette size.

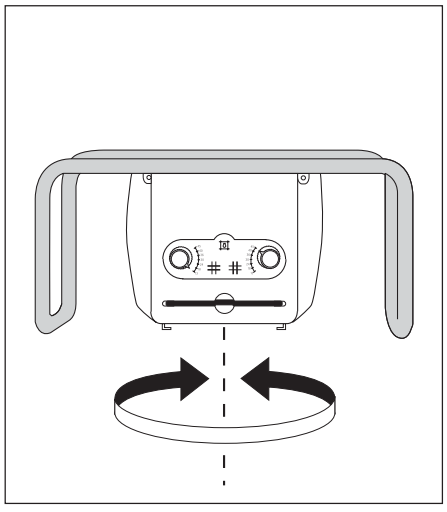
The light field lamp goes out automatically after approx. 30 s.

Example ▶



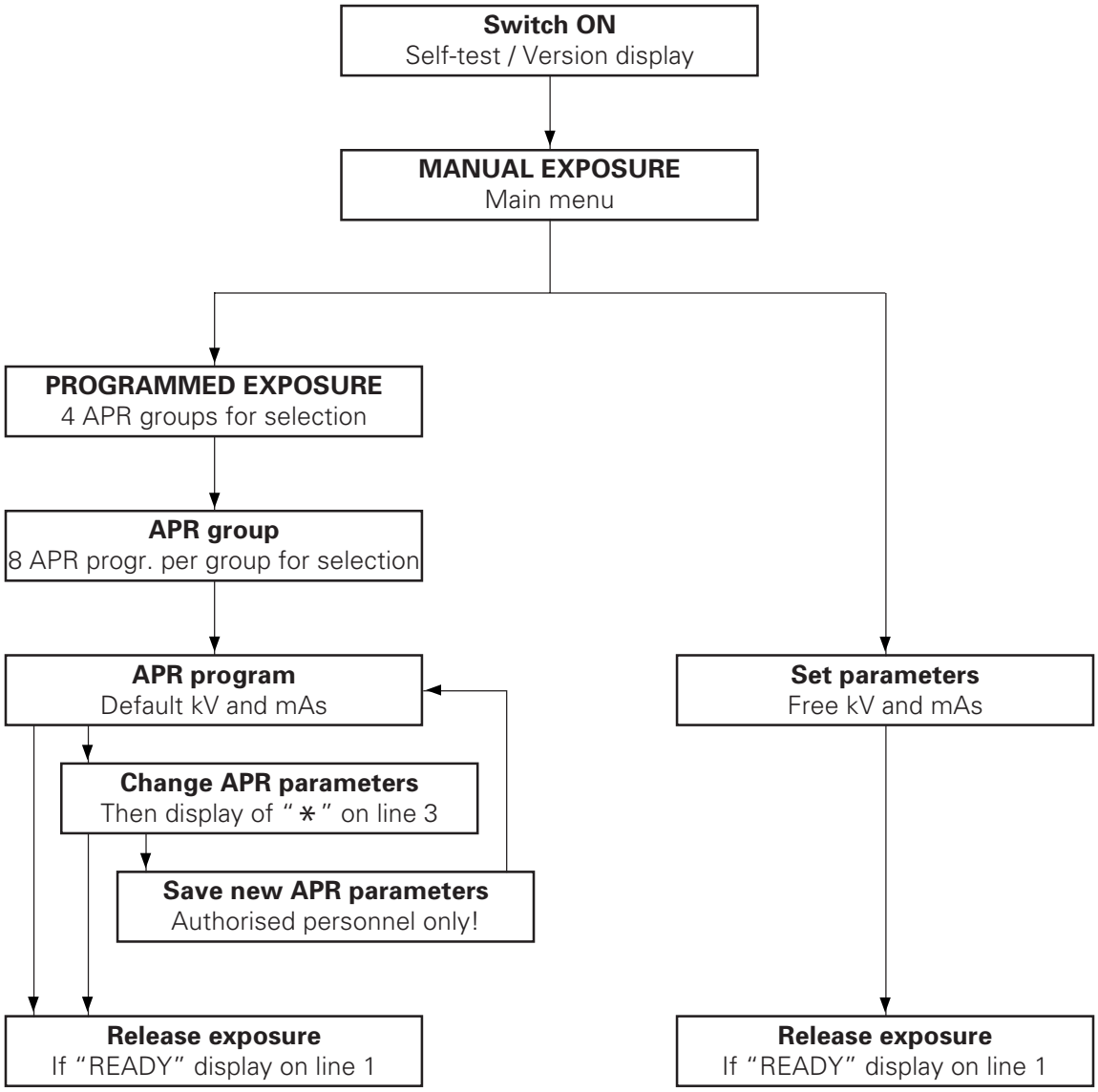


3. On the angle scales you can check the position of the tube assembly.



4. The collimator can also be swivelled.

Overview of operation



Program overview

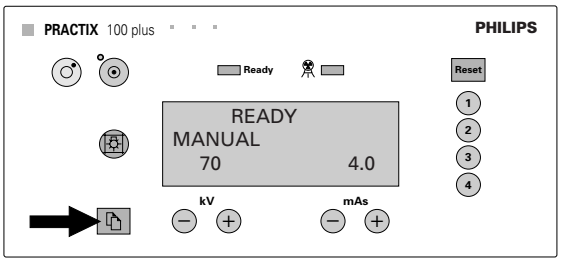
Four APR groups, each with eight APR programs, are available for selection.
You will find the factory-set kV and mAs values in the exposure table annexed.

APR group	APR program
1. SKULL / TRUNK	
	Thorax AP
	Skull
	Cervical spine
	Dorsal spine AP
	Lumbar spine AP
	Abdomen AP
	Pelvis AP
	Hip AP
2. UPPER EXTREMITIES	
	Shoulder AP
	Clavicle
	Humerus/elbow
	Elbow
	Lower arm
	Wrist
	Hand AP
	Finger
3. LOWER EXTREMITIES	
	Hip/femur
	Femur
	Knee
	Lower leg
	TCJ
	Calcaneum
	Foot
	Toes
4. PEDIATRICS	
	Thorax 0.5 kg
	Thorax 1.0 kg
	Thorax 2.0 kg
	Thorax 4.0 kg
	Thorax 6.0 kg
	Thorax 8.0 kg
	Thorax 10 kg
	Thorax 15 kg

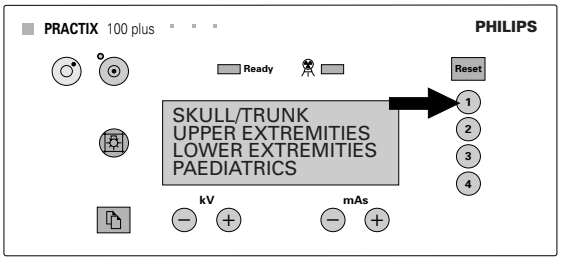
Programmed exposure (APR mode)

A few seconds after switching ON (see page 12) the main menu appears.

1. Press [⎘] to access the overview of the four APR groups.



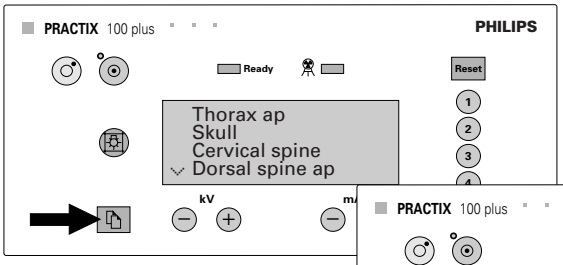
2. With (1) (2) (3) (4) select one of the four groups displayed. Each group contains eight APR programs.



- *Press [Reset] to return to the previous menu.*

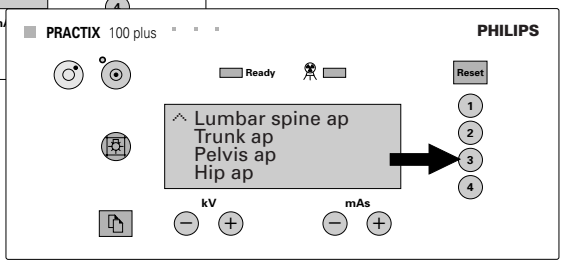
3. The list of eight APR programs takes up **two** pages. You will see this from the symbol indicating the next (⋱) or previous (⋰) page.

   With [⎘] you go from the first page to the second page (and back again).

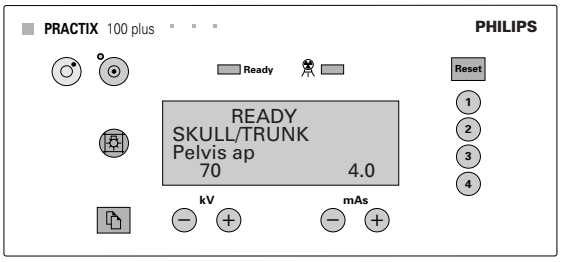


- *Press [Reset] to return to the previous menu.*

4. With (1) (2) (3) (4) select the object/organ.



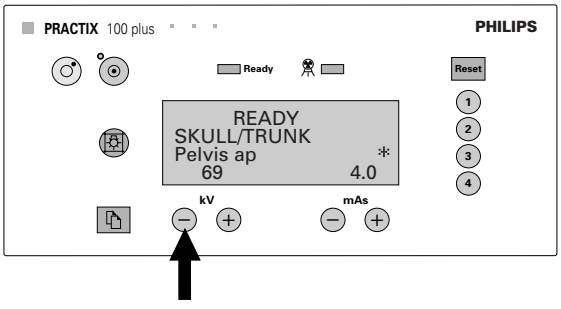
5. The object/organ selected and the default exposure parameters (kV and mAs) are displayed.



- *Press [Reset] to return to the APR groups.*
- *Press (2) to return to the APR programs.*

6. If necessary, you can change the exposure parameters by pressing ⊖⊕ for kV and mAs.

   An asterisk ("✳") indicates that the exposure parameters have changed; however, they are not permanently stored.
   If you restore the original kV and mAs values, the asterisk remains.

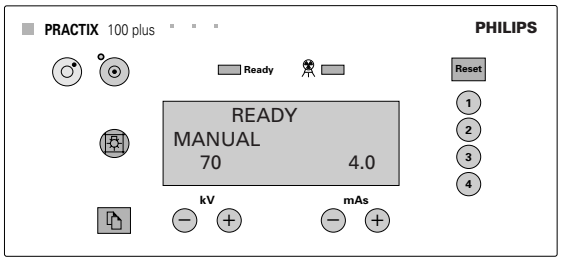


- *You can also store the changed exposure parameters as presets for the APR program (see page 20).*

Manual exposure

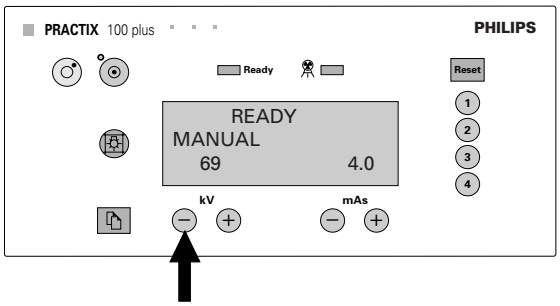
A few seconds after switching ON (see page 12) the main menu appears.
After a Programmed Exposure (see page 16) you also access the main menu by pressing Reset more than once.

- The exposure parameters last valid (kV and mAs) are displayed.



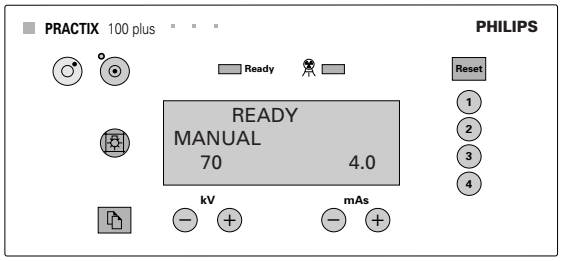
Note: The exposure parameters illustrated are only examples.

- With ⊖⊕ you can change the exposure parameters.



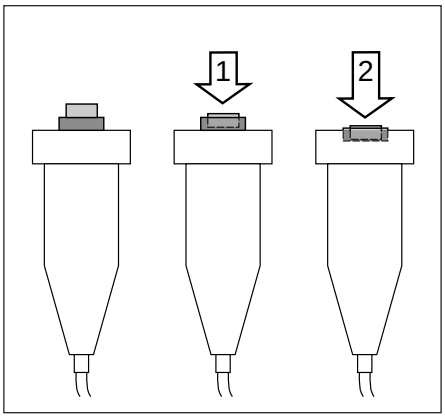
Radiography

1. When Ready lights up and "READY" appears on the first line of the display, the unit is ready for exposure.



- Keep as far away from the tube assembly as possible.

2. The handswitch is a two-position switch.
   Pos. 1: preparation (approx. 1 s)
   Pos. 2: release exposure.



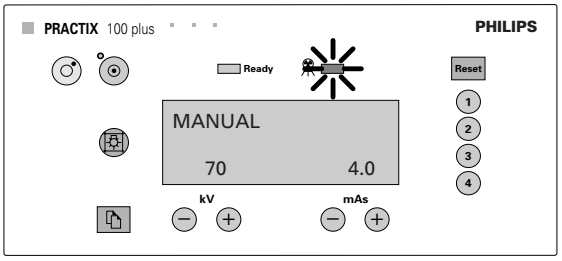
- You can press the switch straight through to position 2. Until exposure release about another 1.2 s elapse (approx. 2.4 s on the 115 V version).

- Keep the switch pressed until exposure has been completed properly (three beeps); then let go.

During exposure

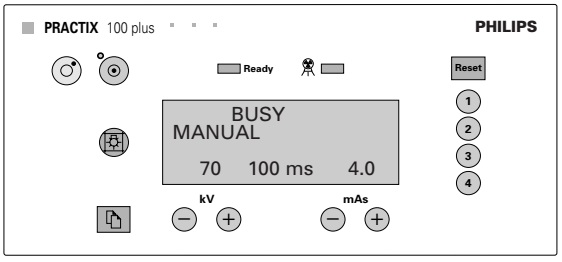
– The Ready indicator lights up ("Radiation ON").

– The Ready indicator goes out ("Unit ready for radiation").



After exposure

– Three beeps indicate that the exposure has been completed properly
– The exposure time appears in ms on the fourth line of the display, until the next change in exposure parameters or until the next exposure
– The "WAIT" display appears on the first line if a waiting period is necessary
– The unit is ready for the next exposure when the Ready indicator lights up and "READY" appears on the first line of the display.

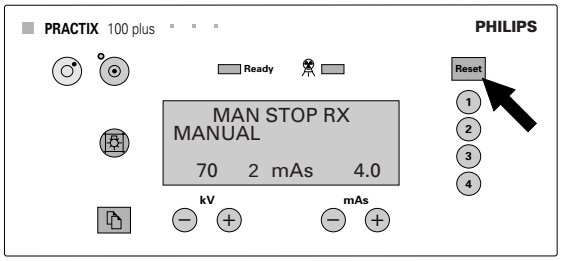


Note: The exposure parameters illustrated are only examples.

If you let go of the handswitch prematurely

– Radiation will be interrupted
– A long beep (1.2 s) indicates that exposure has not been completed properly
– "EXP. INTERRUPTED" appears on the first line
– The mAs value used so far appears on the fourth line.

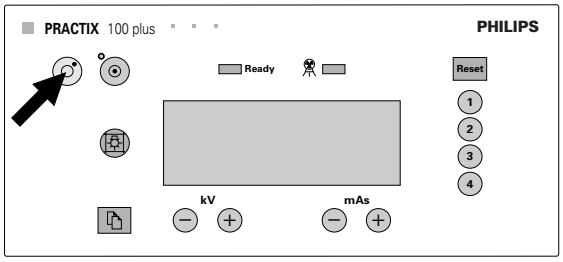
- Press Reset to acknowledge the message. Then repeat the exposure.

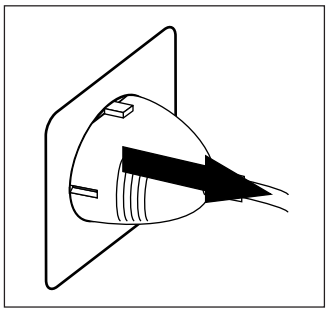


Terminating operation

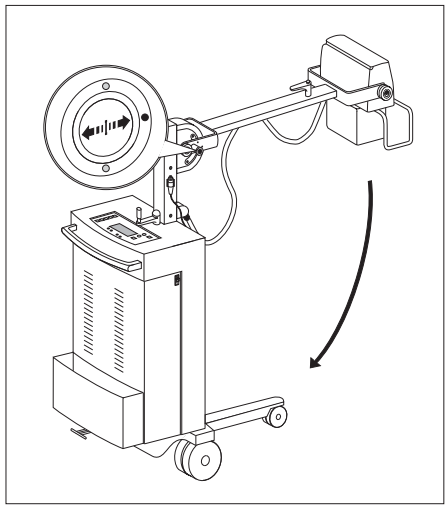
Never pull out the mains plug when the unit is switched on.

- First switch OFF the unit with
- Then pull out the plug (not pulling on the cable)
- Wind up the cable
- If necessary, prepare the unit for transport (see page 10).

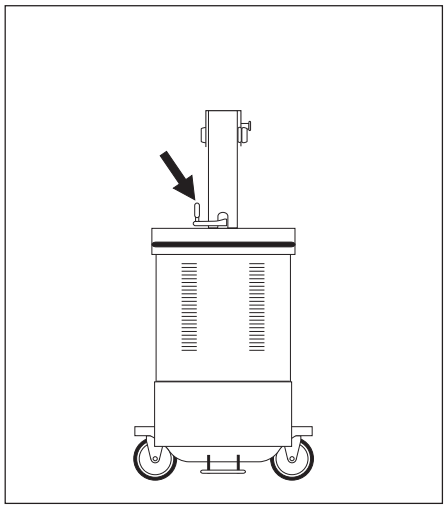




Parking the unit (in the parking position)



1. Swing the tube carrier arm down until the transport securing device locks in place (see page 10); in doing so, set the tube assembly vertical and tighten up the fixing grip.



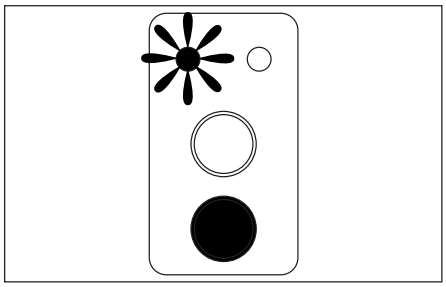
*2. Set the travel joystick to the left. The wheels are set at **left** angles and the brakes are applied.*

- After exposure the dose area products will be added until you reset to "0" or switch off the unit.
- If you use additional filters in the lower rails of the collimator, the displayed DAP values are not conform with the factual values.
- Philips recommends to calibrate the Diamentor every two years (refer to the Service Manual).
- Philips recommends to reset the DAP value to "0" after examination of every patient.

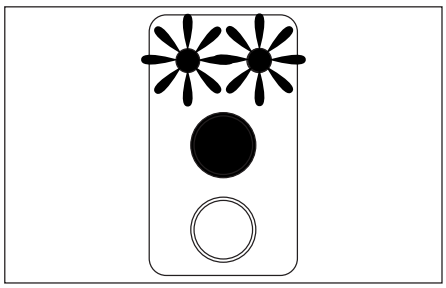
Remote control *(option)*

- Make sure that no more IR transmitter with the same safety code are used in your house.
- Use remote control: Switch on remote control on selection switch. The receiver indicators lit green.
- Point the remote control laterally at the unit to ensure a safe connection.
- Do not allow unauthorized use.
- The receiver indicators flicker green at IR connection between unit and remote control.

- Switch on light beam lamp to check position of radiation area.
  The LED is lit.



- Release exposure;
  this switch is a two-step switch too.
  Both LEDs are lit.

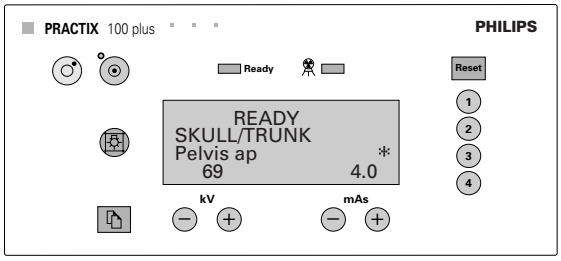


- Warning signals
  – If the remote control is not inserted into the holding device for more than 3 min, every 30 s a warning signal can be heard. For examination 2 min are available. After 5 min every 30 s a triple beep can be heard. That means that the remote control will switch off soon. Put the remote control into the holding device at the unit.
  – Change the battery if both LEDs are flashing.
  – At malfunction the receiver indicator lits red.

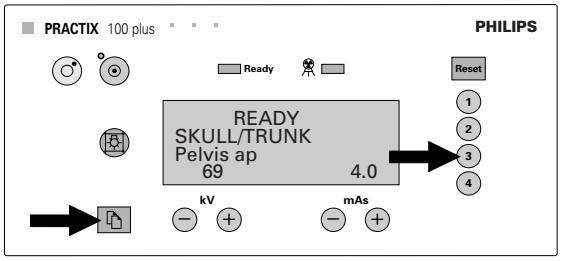
Saving APR parameters

The factory-set kV and mAs values in the APR programs may only be changed and stored by authorised personnel.

Requirements:
- Saving APR values is possible (setting by Customer Service).
- The unit is in the Programmed Exposure mode (see page 16).
- The APR program to be changed is selected.
- You have changed the default exposure parameters; this is indicated by "✻" on the display.
- You wish to save the changed exposure parameters permanently as a preset for the APR program.



To save:
- Press (3) and keep it pressed, then press [⧉] until "✻" disappears.



- *With (2) you return to the APR programs.*
- *With [Reset] you return to the APR programs.*
  If you press [Reset] again you return to the main menu (Manual Exposure)

Maintenance

As with any technical appliance this X-ray equipment also requires
– proper operation,
– regular testing by the user,
– regular service and repair.

By taking these precautions you maintain the operability and operational reliability of the system. As the user of an X-ray unit you are obliged according to accident prevention regulations, the medical products law and other regulations to take such precautions.

Maintenance consists of **tests which the user can perform** and **maintenance** which is performed under service agreements, Philips service orders or by persons explicitly authorised to do so by Philips.

Safety checks according to the Medical Device Directive

The safety checks cover operability and operational reliability. They must be performed at least every 2 years. These tests constitute part of our preventive maintenance under our service agreements.
They cover
– visual checking for completeness and apparent damage or defects as well as soiling, sticking parts and wear and tear which may affect safety,
– testing the necessary monitoring, safety, display and indicating systems,
– measuring the safety-relevant output parameters,
– checking electrical safety as well as the operability of an internal energy supply,
– for the particular product other special technical tests according to the generally accepted standards of engineering practice,
– other necessary tests specified by the manufacturer,
– recording results and filing the test reports in the X-ray system manual (medical products logbook).

Tests by the user

The user must check the X-ray equipment for apparent defects (see table). If operational defects or other departures from normal operational behaviour occur, he must switch off the X-ray unit and inform the Service Organisation. He may only resume operation of the X-ray equipment when it has been repaired. Operation using faulty components may lead to an increased safety risk or unnecessarily high exposure to radiation.

Interval	Scope	Method
Daily	Stability test	
Daily	Faulty display lamps, damaged components, labels and warning signs	Inspection
Weekly	All cables and terminals (damage, breakage)	Inspection
Weekly	Oil leaks and unusual noises emanating from the high-voltage generator	Inspection
6 months	Centring aids for X-ray tube assembly and image receptor (marks, catches, contacts)	Inspection

X-ray units contain mechanical components such as drive chains, ropes, steel strips and gears which are subjected to wear and tear due to operation. They include means of suspension for heavy components (e.g. image intensifier, X-ray tube assembly etc.). After a lengthy period of operation the safety of the suspension may be impaired by wear and tear (e.g. rope break).

The correct setting of the electromechanical and electronic assemblies affects the functioning, image quality, electrical safety and exposure of the patient and medical personnel to radiation.

Philips recommends you to
- **perform the tests indicated in the table on a regular basis,**
- **have the X-ray unit serviced by the Philips Service Organisation at least once a year. You must have heavily used X-ray equipment subjected to maintenance more frequently.**

In this way you avoid endangering the patient and you meet your obligations.

By entering into a service agreement with Philips you retain the value and safety of your X-ray equipment. All the necessary maintenance, including the safety tests for the purpose of preventive avoidance of danger and the necessary settings for optimum image quality and minimum exposure to radiation, are performed at regular intervals. Philips agrees on these intervals with you, taking the legal requirements into account.

Repairs

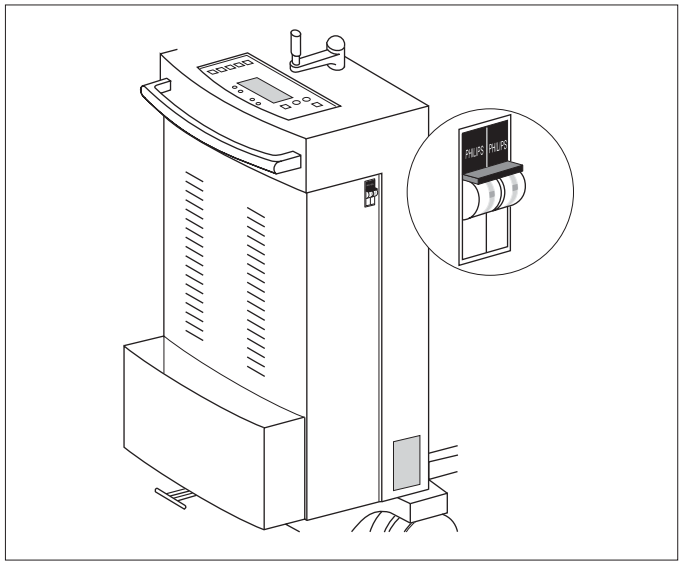
Faulty components which affect the safety of the X-ray equipment must be replaced by genuine spare parts.

Recording results

Service and repairs must be entered in the medical products logbook, including the following data:
- type and scope of work,
- if necessary, details of any changes to ratings or the working zone,
- date, person performing the work, signature.

Main fuse

If there is an excess flow of electric current, the circuit will be broken by a fuse.
- Reset the fuse by pressing the green button.



Cleaning

Please bear the following in mind when choosing a detergent:
To clean plastic surfaces you must never use anything other than soap and water. If other detergents are used (e.g. with a high alcohol content) the material will become matt or tend to crack. Never use any corrosive, solvent or abrasive detergents or polishes.

When cleaning, please observe the following:

- Before cleaning the X-ray equipment switch off at the mains. The capacitor may still be live 4 hours after switching off.
- Ensure that no water or other liquids can enter the X-ray equipment. This precaution prevents electrical short-circuits and corrosion forming on components.
- You should wipe enameled parts and aluminium surfaces only with a damp cloth and mild detergent and then rub with a dry woollen cloth.
- Rub down chrome parts with a dry woollen cloth only.

Disinfection

The method of disinfection used must conform to the legal regulations and guidelines regarding disinfection and explosion protection.

Never use any corrosive, solvent or abrasive detergents or polishes.

If you use disinfectants which form explosive mixtures of gases, these must first have evaporated before you switch the X-ray equipment on again.

- Before disinfecting the X-ray equipment switch off at the mains. The capacitor may still be live 4 hours after switching off.
- You may disinfect all parts of the X-ray equipment, including the accessories and connecting cables, by wiping only.
- Disinfection by spraying is not to be recommended because the disinfectant may enter the X-ray equipment.
- If you perform a room disinfection with an atomizer, you must switch off the X-ray equipment first. When the X-ray equipment has cooled down, cover it over carefully with a plastic sheet. When the mist of disinfectant has subsided you can remove the plastic sheets and disinfect the X-ray equipment by wiping.

Technical data

Mechanical data

Focal spot-floor distance	456 mm ... 2018 mm
Rotation of tube assembly round the horizontal axis of the carrier arm	±180°
Rotation of tube assembly round its longitudinal axis	-18° … +133°
Cassette compartments	For four cassettes each up to 35 cm x 43 cm
For operation/transit and storage:	
– Ambient temperature	+10 °C … +40 °C / -25 °C … +70 °C
– Rel. humidity	30% … 75% / 10% … 90%
– Atmospheric pressure	700 hPa … 1060 hPa
Weight	170 kg

Generator

Safety class (IEC 60601-1)	Class I/B
Power supply	230 V, 50 Hz/60 Hz; 115 V, 50 Hz/60 Hz; single-phase with earth lead
Automatic compensation for voltage fluctuations	±10%
Maximum current input	9 A
Mains resistance and fuses	at 230 V: 1 Ω, T 16 A at 115 V: 1 Ω, T 16 A
Nominal power (IEC 60601-1/90)	11 kW at 100 kV and 100 ms
kV values	40 kV … 125 kV in 1-kV steps
mAs values	at 230 V and 115 V: 0,2 mAs … 125 mAs in 12.5% steps

Max. tube currents (230 V)

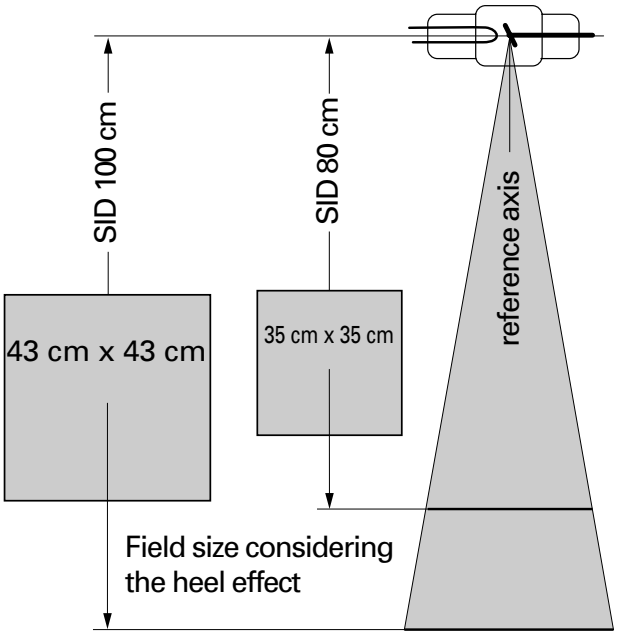
	t≤100 ms	t>100 ms	Q<0,63 mAs
125 kV	75 mA	38 mA	38 mA
110 kV	90 mA	45 mA	45 mA
100 kV	110 mA	55 mA	55 mA
40 kV	140 mA	70 mA	70 mA

X-ray tube

Nominal voltage		125 kV
Focal spot	Nominal focal spot value	0,8
Cathode	Maximum filament current for connection to the generators	5.4 A
Anode	Nominal input power for the equivalent anode input power of 20 W	11 kW
	Maximum heat dissipation during continuous operation	175 W
	Maximum anode heat content	50 kJ
	Anode diameter	64 mm
	Rotating speed/target angle	3 000 min^{-1} / 17.5°
	Anode material	Tungsten
Filtration	Not removable (filter value: Al equivalent)	≥ 0.7 mm Al/100 kV (IEC 60522/1999)

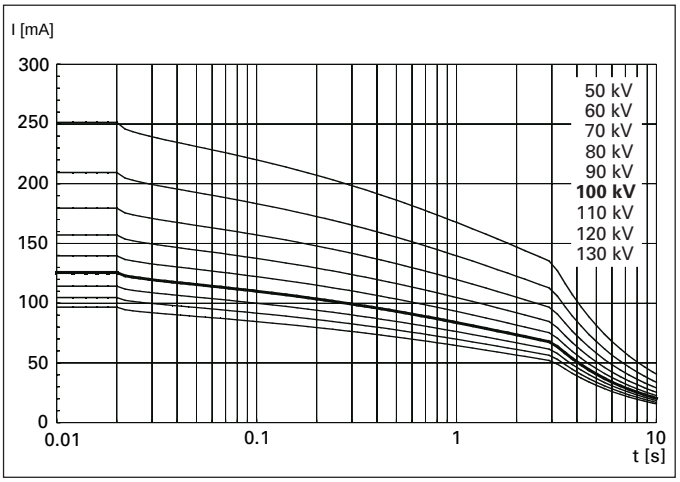
X-ray tube assembly	Maximum continuous heat dissipation	55 W
	Maximum housing temperature	57 °C
	Maximum heat storage capacity	600 kJ
	Radiation protection load factors	125 kV, 2500 mAs/h
	Safety class	Class 1/B
	Thermal safety switch for interlocking the generator	switches at 57 °C ±3 °C
	Ambient temperature for operation	+10 °C … +40 °C
	Temperature for transport and storage	–25 °C … +70 °C

Maximum radiation field

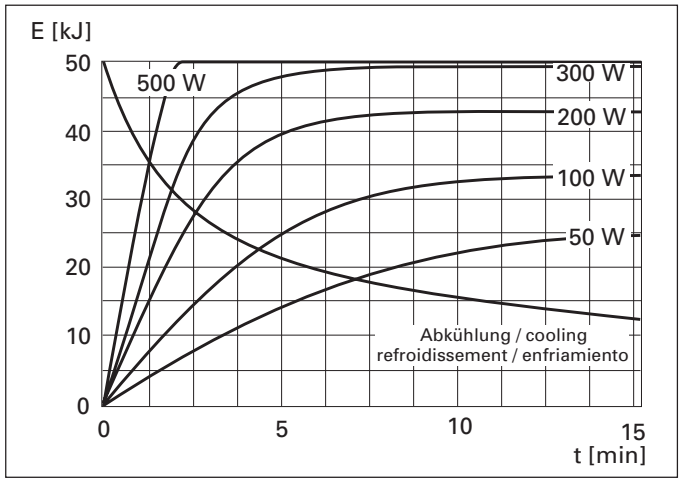


Diaphragm	Rotation	±130°
	Timer for light beam lamp	30 s
	Light beam lamp	12 V / 100 W halogen
X-ray tube assembly with diaphragm	Total filtration (Al equivalent)	>2.7 mm (100 kV)
	Permissible leakage radiation	<1 mGy/h in 1 m dist. from focus, 125 kV, 2500 mAs/h

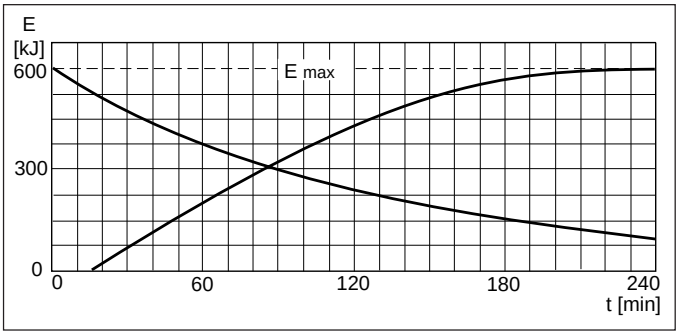
Rating charts



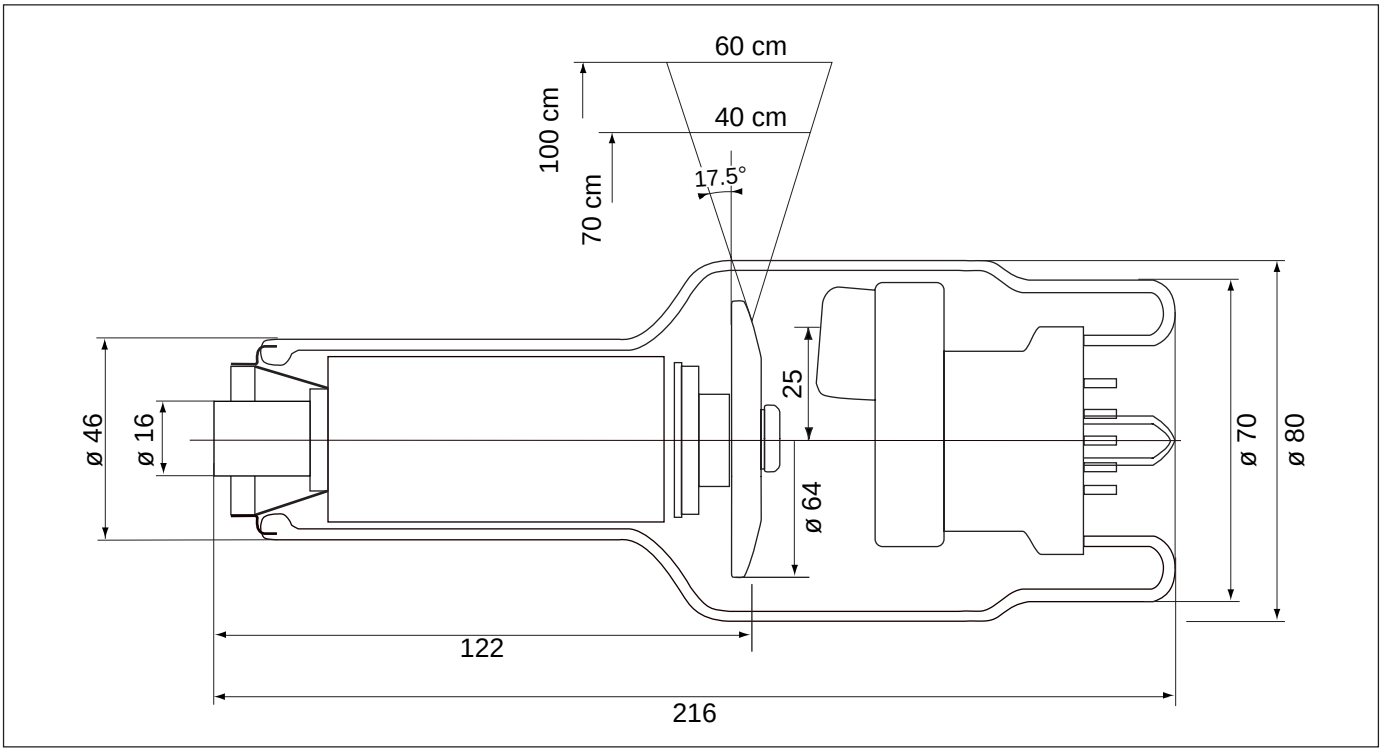
Heating and cooling curves of the anode



Heating and cooling curves of the tube assembly (tank unit)



Technical drawing of the X-ray tube X20

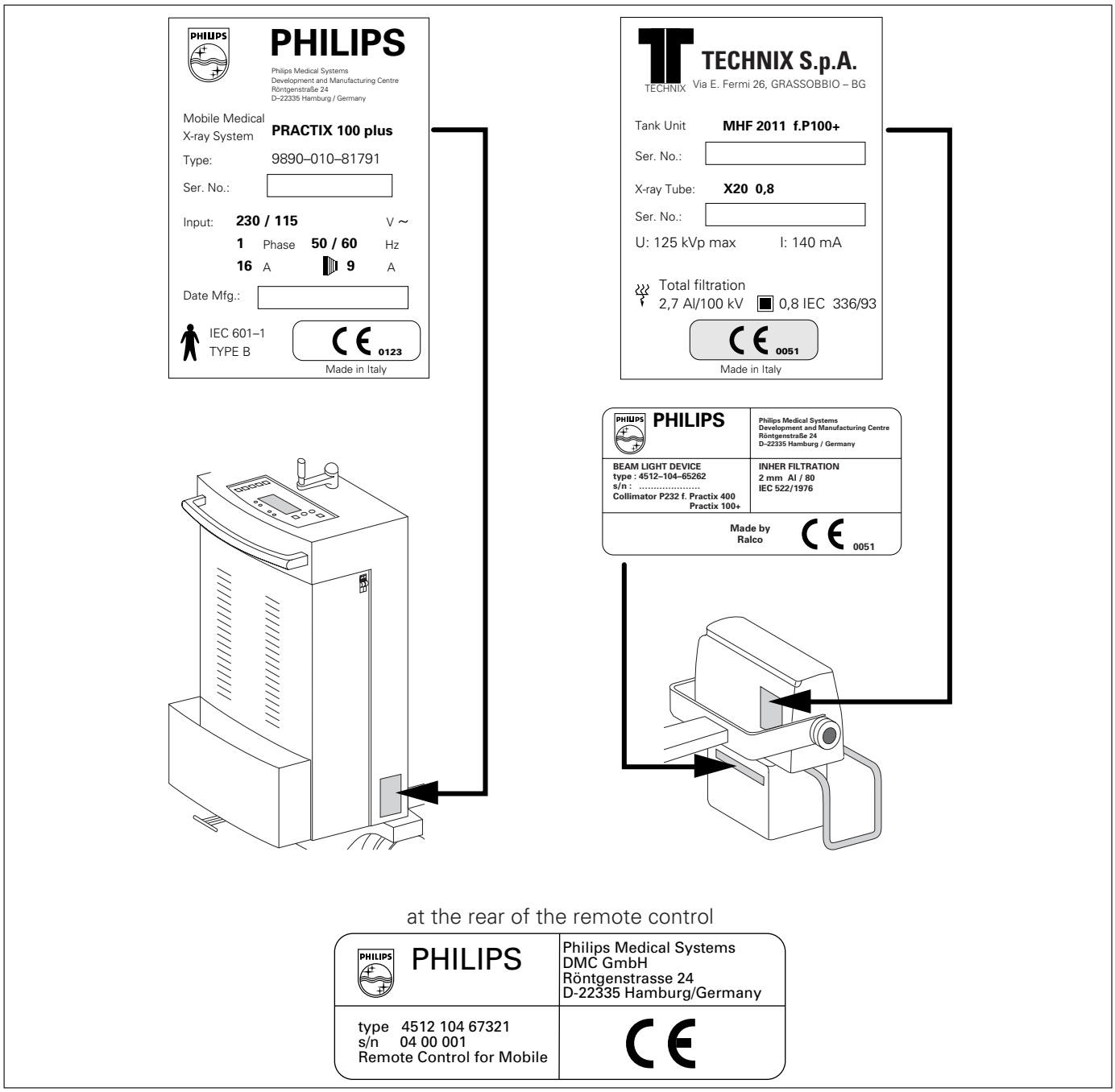


Technical data

	Product name	Type designation
X-ray system with X-ray generator	PRACTIX 100 plus	9890-010-81791
X-ray tube assembly	MHF 2011 f. P100+	4512-132-23001
X-ray tube	X 20 0,8	
Beam limitation system	P 232 f. Practix 100+	4512-104-65262

Manufacturer: Philips Medical Systems, Development and Manufacturing Centre, Hamburg

Type plates



at the rear of the remote control

Appendix

Exposure table

Part of body	kV	mAs	SC [DIN][1]	kV	mAs	S [DIN]	Remarks
Skull and trunk							
Skull a-p/p-a	78	5	400				
Skull lat.	74	2.5	400				
Cervical spine a-p	66	6.3	400				
Cervical spine lat. / oblique	74	2.5	400				
Dorsal spine a-p	78	6.3	400				
Dorsal spine lat.	80-85	10	400				
Lumbar spine a-p	78	6.3	400				
Lumbar spine lat. / oblique	85	13	400				
Hip a-p	77	5	400				
Pelvis a-p	77	3.2	400				
Thorax, recumbent (bed)	85	3.2	200				
Ribs 1-7	66	5	400				
Ribs 8-12	78	3.2	400				
Abdomen	85	5	400				
Abdomen lateral	90	8	400				
Upper extremities							
Fingers	46	1.6	200				
Thumb	46	2.5	200				
Hand a-p	46	2.5	200				
Wrist a-p	48	2.5	200				
Wrist lat.	50	2.5	200				
Lower arm and wrist a-p	52	3.2	200				
Lower arm and wrist lat.	52	4	200				
Lower arm and elbow a-p	56	2.5	200				
Lower arm and elbow lat.	56	4	200				
Elbow a-p	56	4	200				
Elbow lat.	56	5	200				
Humerus and elbow a-p	60	4	200				
Humerus and elbow lat.	60	5	200				
Humerus and shoulder a-p	66	10	200				
Humerus and shoulder lat.	66	10	200				
Shoulder a-p	66	16	200				
Clavicle	66	10	200				

Appendix

Part of body	kV	mAs	SC [DIN][1]	kV	mAs	S [DIN]	Remarks
Lower extremities							
Toes	46	2	200				
Tarsus a-p	48	2	200				
Tarsus obl.	48	2.5	200				
Metatarsus a-p	50	2.5	200				
Metatarsus obl.	50	4	200				
Talo-calcaneonavicular joint a-p	56	4	200				
Talo-calcaneonavicular joint obl.	52	2	200				
Talo-crural joint a-p	55	4	200				
Talo-crural joint lat.	56	4	200				
Calcaneum axial	56	5	200				
Calcaneum lat.	52	3.2	200				
Lower leg und TCJ a.-p.	58	2.5	200				
Lower leg und TCJ lat.	58	2.5	200				
Lower leg and knee a-p	60	4	200				
Lower leg and knee lat.	60	3.2	200				
Knee a-p	66	4	200				
Knee lat.	66	3.2	200				
Femur and knee a-p/lat.	66	6.3	200				
Femur and hip a-p	74	5	400				
Pediatrics							
• Added filter 1 mm Al + 0,2 mm Cu[2]							
Infant lung 0.8 - 1.0 kg	60	0.2	400				
Infant lung 1.0 - 1.4 kg	60	0.3	400				
Infant lung 1.4 - 1.8 kg	60	0.4	400				
Infant lung 1.8 - 2.2 kg	62	0.4	400				
Infant lung 2.2 - 3.0 kg	65	0.4	400				
Infant lung 3.0 - 3.5 kg	68	0.4	400				
Infant lung 3.5 - 4.0 kg	70	0.4	400				
Infant lung 4.0 - 4.5 kg	72	0.4	400				

The values apply to an SID of 100 cm without grid. For grid cassettes you must increase the mAs values by four increments.
Please enter the kV, mAs and sensitivity S values valid for your equipment.

Example:

Ribs 1-7	66	5	400	*66*	*4*	*480*	

[1]) SC is the sensitivity class. According to DIN 6867-10, a class 400 film/screen system (SC = 400) can cover a sensitivity range of S_{min} = 320 DIN to S_{max} = 560 DIN. From the derived dose value K_s the tolerance for S will be approx. ±30%.
[2]) The filter combination of 1 mm Al + 0.1 mm Cu is also permissible.

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